

**REMARKS**

In the Office Action, the Examiner rejected claims 1, 2, and 5-15. By the present Response, Applicants have not amended, cancelled, or added any claims. In view of the following remarks, Applicants respectfully request reconsideration and allowance of all pending claims.

**Claim Rejection Under 35 U.S.C. § 112, first paragraph**

The Examiner rejected claims 1, 2 and 5-15 under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. The Applicants respectfully traverse this rejection.

Regarding the enablement requirement, the Examiner has the initial burden to establish a *reasonable basis* to question the enablement provided for the claimed invention. *In re Wright*, 999 F.2d 1557, 1562, 27 U.S.P.Q.2d 1510, 1513 (Fed. Cir. 1993). The test for enablement, as set forth by the Supreme Court, is whether the experimentation needed to practice the invention is undue or unreasonable. *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916). A patent need not teach, and preferably omits, what is well known in the art. *In re Buchner*, 929 F.2d 660, 661, 18 U.S.P.Q.2d 1331, 1332 (Fed. Cir. 1991). The *undue experimentation* test essentially evaluates whether one of reasonable skill in the art can make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation. *U.S. v. Teletronics, Inc.*, 857 F.2d 778, 785, 8 U.S.P.Q.2d 1217, 1223 (Fed. Cir. 1988). As long as the specification discloses at least one method for making and using the claimed invention that bears a *reasonable correlation* to the entire scope of the claim, then the enablement requirement of Section 112 is satisfied. *In re Fisher*, 427 F.2d 833, 839, 166 U.S.P.Q. 18, 24 (C.C.P.A. 1970).

Independent claim 1 recites that each of a plurality of semiconductor die stacks comprises "at least two semiconductor die permanently coupled together by adhesive ... and wherein the plurality of semiconductor die stacks *do not include a substrate*." (Emphasis added). Similarly, claim 10 recites that each of a plurality of semiconductor die stacks

comprises “at least two semiconductor die coupled together by set adhesive that has been cured ... and wherein the plurality of semiconductor die stacks *do not include a substrate*.” (Emphasis added).

In rejecting independent claims 1 and 10, the Examiner stated the following:

The definition of a substrate is a supporting material on or *in which* the components of an integrated circuit are *fabricated or attached*, or an insulating layer that components are formed on; therefore, since the dies contain circuits formed in semiconductor substrates the stack includes a substrate. Alternatively, the die stacks are formed on/attached to a holder albeit temporarily and therefore the holder is still within the definition of a substrate. As such, the claim is not enabled, since one skilled in the art to which it pertains, or with which it is most nearly connected, cannot make a stack formed on *what it excludes*.

Office Action, p. 2 (emphasis in original). Additionally, in the “Response to Arguments” portion of the Office Action, the Examiner stated that “[w]ith respect to applicant’s contention that one of ordinary skill would not construe adie [sic] as having a substrate, examiner disagrees” and that “[t]here are countless references as exemplified by nwley [sic] cited Gerritsen et al. (U.S. 2003/0207569) that establish a chip formed of a e.g. ‘silicon substrate.’” *Id.* p. 6.

Regarding the enablement requirement of 35 U.S.C. § 112, first paragraph, Applicants assert that one of ordinary skill in the art would clearly understand how to form a die stack *without a substrate* based on the disclosure of the present application. *See, e.g.*, Application, page 17, line 16 – page 18, line 11. Indeed, this concept is discussed in great detail throughout the application and distinguishes present embodiments from prior art in which packages are assembled by sequentially stacking die directly on a substrate. For example, in various places throughout the present application, a temporary holding surface is contrasted with a substrate. *See, e.g.*, page 12, lines 15-17.

In the Office Action, the Examiner apparently asserted that a die stack inherently includes a substrate. *See* Office Action, page 2. Specifically, as set forth above, the Examiner provided

his own definition of a substrate by stating that “[t]he definition of a substrate is a supporting material on or *in which* the components of an integrated circuit are *fabricated or attached*, or an insulating layer that components are formed on.” Office Action, p. 2 (emphasis in original). The Examiner did not provide a source for this definition. However, the Examiner did point to Gerritsen et al. (U.S. Pub. No. 2003/0207569) (hereafter referred to as “the Gerritsen reference”) as support for the Examiner’s apparent assertion that because the recited “die stack” of claims 1 and 10 includes individual die that the “die stack” necessarily includes a substrate. *See* Office Action, p. 6. Applicants remind the Examiner that the claim terms are to be interpreted *in view of the specification*. It is inappropriate for the Examiner to simply make up his own definition. Further, as will be discussed further below, the Gerritsen reference should not be used to interpret the claim terms over the specification. Indeed, the Gerritsen reference is not even directed to the same specific area of technology as that of the present application.

With regard to the definition supplied by the Examiner of a “substrate” and the Examiner’s general use of the Gerritsen reference to interpret the meaning of a “substrate” in the present claim recitations, Applicants note that they are well aware that *some* definitions of a “substrate” are quite broad. However, Applicants stress that the English language is limited, and, thus, certain identical terms may be used in different contexts (e.g., different areas of technology) to provide different meanings. These limitations on language were likely contemplated by the courts when they established the precedent that requires claims to be interpreted in view of the specification. Indeed, according to legal precedent, during patent examination, the pending claims must be given their broadest *reasonable* interpretation *consistent* with the specification. *See In re Prater*, 415 F.2d 1393, 1404-05, 162 U.S.P.Q. 541, 550-51 (C.C.P.A. 1969); *see also In re Morris*, 127 F.3d 1048, 1054-55, 44 U.S.P.Q.2d 1023, 1027-28 (Fed. Cir. 1997); *see also* M.P.E.P. §§ 608.01(o) and 2111. Further, interpretation of the claims must also be consistent with the interpretation that those skilled in the art would reach. *See In re Cortright*, 165 F.3d 1353, 1359, 49 U.S.P.Q.2d 1464, 1468 (Fed. Cir. 1999); *see also* M.P.E.P. § 2111. Thus, Applicants assert that the Examiner’s attempt to provide his own definition of the term “substrate” was improper. Further, the Examiner should not attempt to define the meaning of

claim terms in the present application based on other references. Indeed, Applicants assert that sufficient context has clearly been provided by the present specification for an appropriate interpretation of the term “substrate.”

With regard to the Examiner’s assertions based on the Gerritsen reference, Applicants assert that the Gerritsen reference is generally directed to a process for forming microelectronic devices or integrated circuits (e.g., CMOS and PMOS devices). Specifically, the Gerritsen reference is directed to forming certain features (i.e., layers) of an integrated circuit, which may generally be referred to as a “die.” In the Gerritsen reference, the surface on which layers are formed is referred to as a “silicon semiconductor *substrate*.” *Id.*, Abstract (emphasis added). Based on this disclosure, the Examiner apparently asserted that the recited die stacks of claims 1 and 10 include substrates. However, Applicants stress that the Gerritsen reference is directed to forming *die*. In contrast, the present application is directed to stacking die that have already been formed. In other words, the present application is directed to forming *die stacks*. There is a clear issue of scale. Thus, the Gerritsen reference is essentially in a different area of technology than the claims of the present application. When forming die stacks, the term “substrate” has a completely different meaning than it would in a process for forming a die. Accordingly, Applicants assert that it was improper for the Examiner to look to a reference directed to forming *die* in order to interpret a term used in an application directed to forming *die stacks*. Indeed, based on the legal precedent set forth above, rather than look to other references, the Examiner should have simply considered the context provided by the present specification.

The claim language set forth in claims 1 and 10, on its face, clearly indicates that the die stacks *do not include* substrates. Additionally, the specification clearly indicates that die stacks are eventually *stacked on* a substrate to form a package. They are not *integral with* the substrate. Further, the term “substrate” has a well known meaning in the art. *Based on the context in which the term is utilized in the specification*, one of ordinary skill in the art would readily discern the intended meaning. For example, the die stacks are described as being coupled to the substrate to form a package, such as the packages illustrated in FIGS. 2 and 3 of the application. *See e.g.*,

Application, page 18, lines 9-11. Prior to coupling the die stacks to the substrate, the die stacks do not include a substrate, and certainly do not form a package.

In summary, the Examiner's assertion that one of ordinary skill in the art would be confused about the meaning of the term "substrate" is unfounded. Indeed, Applicants assert that based on the context in which the term "substrate" is used in the specification and based on the customary meaning of the term in the art, one of ordinary skill in the art would clearly understand the intended meaning. Further, Applicants assert that any confusion with respect to this claim feature merely arose because the Examiner attempted to provide his own unreasonably broad definition for the term and looked to other areas of technology for support. Those skilled in the art would not make such an interpretation, nor would they be confused as to how to make or use the invention, as recited in the present claims.

Second, the Examiner apparently asserted that the temporary holding surface is a substrate. *See* Office Action, page 2. Again, this is clearly not the case. As set forth above, the term "substrate" has a well known meaning in the art. The definition that is apparently being asserted by the Examiner is unreasonably broad. Indeed, according to the Examiner it seems that anything on which a die stack is placed can be interpreted as a substrate. This clearly does not fit with the customary meaning of the term or the meaning of the term based on the context of its use throughout the present application. For example, as set forth in the present application, attaching a substrate to a die stack forms a package. *See e.g.*, Application, page 17, line 16 – page 18, line 11. However, when a die stack is placed on a temporary holding surface, a package is not formed. Attachment to a substrate is clearly understood by those skilled in the art to connote a permanent attachment, rather than a temporary placement.

In view of the remarks set forth above, Applicants assert that independent claims 1 and 10, as well as those claims dependent thereon, are fully compliant with the requirements of 35 U.S.C. § 112, first paragraph. Accordingly, Applicants request that the Examiner withdraw

the rejection of claims 1, 2 and 5-15 under 35 U.S.C. § 112, first paragraph, and provide an indication of allowance for claims 1, 2 and 5-15.

**Claim Rejections Under 35 U.S.C. § 102**

In the Office Action, the Examiner rejected claims 1, 5, 10 and 11 under 35 U.S.C. § 102(e) as being anticipated by Ball (U.S. 7,371,612) (hereafter referred to as “the Ball reference”). Applicants respectfully traverse this rejection.

Anticipation under 35 U.S.C. § 102 can be found only if a single reference shows exactly what is claimed. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 U.S.P.Q. 773 (Fed. Cir. 1985). For a prior art reference to anticipate under 35 U.S.C. § 102, every element of the claimed invention must be identically shown in a single reference. *In re Bond*, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990). That is, to maintain a proper rejection under 35 U.S.C. § 102, a single reference must teach each and every element or step of the rejected claim. *Atlas Powder v. E.I. du Pont*, 750 F.2d 1569 (Fed. Cir. 1984). Indeed, the cited reference must not only disclose all of the recited features but must also disclose the part-to-part relationships between the features. See *Lindermann Maschinenfabrik GMBH v. American Hoist & Derrick*, 221 U.S.P.Q. 481, 486 (Fed. Cir.1984). Accordingly, the Applicants need only point to a single element or claimed relationship not found in the cited reference to demonstrate that the cited reference fails to anticipate the claimed subject matter.

Embodiments of the present invention are directed to one or more *die stacks* that are deposited on a temporary holding surface in a *completed* form. See Application, page 12, lines 11-13. For example, using a stacking tip, a completed die stack may be positioned on a temporary holding surface (e.g., a film frame, gel pack, tape reel, or JEDEC tray) for later attachment onto a substrate. See *id.* Thus, the temporary holding surface is configured to temporarily hold the completed die stack for eventual transfer to a permanent coupling with a substrate. For example, the temporary holding surface may facilitate removal of a

completed die stack from the temporary holding surface with a stacking tip. The die forming a completed die stack may be permanently coupled together in the stacked formation prior to moving the die stack from the temporary holding surface to the substrate. For example, the die stack may be cured at a high temperature prior to moving the die stack from the temporary holding surface to the substrate, wherein the curing may set adhesive between die of the die stack to permanently couple the die in the stack together. *See id.*, page 10, lines 1-2 and page 12, lines 13-15. Additionally, prior to attachment to the substrate, the die may be tested to ensure that all die in the stack are functional, thus forming a known good die stack. *See id.*, page 12, lines 15-17. Applicants stress that the present application refers to a known good *die stack* (KGDS), not merely a known good die (KGD). In other words, a *completed die stack* has been tested and is known to be good, thus, becoming a known good die stack and not merely a single and separate known good die.

Accordingly, as amended, independent claim 1 recites, *inter alia*, “A temporary holding surface having a plurality of die stacks thereon ... wherein each of the plurality of semiconductor die stacks comprises at least two semiconductor die permanently coupled together, wherein the stack of at least two semiconductor die comprises a *known good die stack*, and wherein the plurality of semiconductor die stacks do not include a substrate.” (Emphasis added). As amended, independent claim 10 recites, *inter alia*, “[a] tape reel having a plurality of semiconductor die stacks thereon ... wherein each of the plurality of semiconductor die stacks comprises at least two semiconductor die coupled together by set adhesive that has been cured, wherein each of the plurality of semiconductor die stacks comprises a *known good die stack*, and wherein the plurality of semiconductor die stacks do not include a substrate.” (Emphasis added).

In contrast, the Ball reference fails to disclose a temporary holding surface or a tape reel having a plurality of die stacks thereon, wherein each of the die stacks comprises a *known good die stack*, as recited in amended claims 1 and 10. In the Office Action, the Examiner merely suggested that because the Ball reference discloses testing a wafer, it discloses a known good die

or KGD. *See* Office Action, p. 6. The Examiner does not even appear to allege that the Ball reference actually discloses a known good die *stack* or KGDS. Indeed, the Examiner provides no indication of where the Ball reference allegedly discloses a known good die *stack* or KGDS. Applicants stress that just because a stack includes a KGD, it does not necessarily constitute a KGDS. Indeed, while all of the die in a die stack may have been tested, the stack itself may not function and certainly may not be a known good die stack. Accordingly, because the Ball reference is deficient in this regard, Applicants assert that the Ball reference cannot anticipate independent claims 1 and 10, as amended. Thus, Applicants respectfully request that the Examiner withdraw the rejection under 35 U.S.C. § 102 and provide an indication of allowance. The claims depending from claims 1 and 10 should also be allowed based on their dependency from an allowable base claim and for other unique features recited in each dependent claim.

**Claim Rejections Under 35 U.S.C. § 103(a)**

In the Office Action, the Examiner rejected claims 2, 6, 7, 12 and 13 under 35 U.S.C. § 103(a) as being unpatentable over the Ball reference. Applicants respectfully traverse this rejection.

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (B.P.A.I. 1979). To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 U.S.P.Q. 580 (C.C.P.A. 1974). However, it is not enough to show that all the elements exist in the prior art since a claimed invention composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. *KSR International Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007). It is important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. *Id.* Specifically, there must be some articulated reasoning with a rational underpinning to support a conclusion of obviousness; a conclusory statement will not suffice. *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). Indeed, the factual inquiry determining whether to combine references must be thorough

and searching, and it must be based on *objective evidence of record*. See *In re Lee*, 61 U.S.P.Q.2d 1430, 1436 (Fed. Cir. 2002).

Applicants note that all of the claims rejected under 35 U.S.C. § 103 are each dependent (directly or indirectly) on either independent claim 1 or independent claim 10. Thus, each of the claims rejected under 35 U.S.C. § 103 depend from a claim rejected under 35 U.S.C. § 102, based on the Ball reference. As discussed above, the Ball reference does not disclose each and every feature recited in independent claims 1 and 10. Further, the Examiner's mere assertions of obviousness and official notice do not remedy the deficiencies of the Ball reference. As such, the Ball reference, whether considered alone or in conjunction with the Examiner's assertions, is not believed to render the presently pending claims obvious. Accordingly, in view of the arguments set forth above, Applicants respectfully request that the Examiner withdraw each of the rejections under 35 U.S.C. § 103 and provide an indication of allowance for claims 2, 6, 7, 12 and 13.

Further, with regard to the Examiner's rejection of claim 2, Applicants assert that the use of official notice is improper and insufficient. The Examiner asserted that "reel are well known in the art for providing tape material to support chips during dicing." Office Action, p. 5. However, it is unclear to Applicants how this correlates to the recited "tape reel having the plurality of semiconductor die *stacks* thereon," as recited in claim 2. Even if the Examiner's assertion regarding dicing wafers is correct, it does not appear to be relevant to the present claim recitations relating to die *stacks*. Further, if the Examiner chooses to take Official Notice in a future Official Action, Applicants respectfully request that the Examiner produce evidence in support of the Examiner's position and that the Examiner add a reference to the rejection. If the Examiner finds such a reference and applies it in combination with the presently cited references, the Applicants further request that the Examiner specifically identify the portion of the newly cited reference that discloses the allegedly "well known" elements of the instant claim, as discussed above, or withdraw the rejection.

**Payment of Fees and General Authorization for Extensions of Time**

No fees are believed to be due at this time. If any fees, including fees for extensions of time and other reasons, are deemed necessary to advance prosecution of the present application, at this or any other time, Applicants hereby authorize the Commissioner to charge such requisite fees to Deposit Account No. 06-1315; Order No. MICS:0078-5. In accordance with 37 C.F.R. § 1.136, Applicants hereby provide a general authorization to treat this and any future reply requiring an extension of time as incorporating a request thereof.

**Conclusion**

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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